System Specification

System Stress Test Thread, Thor DP1

Checkout and Launch Control System (CLCS)

84K00302-021

System Stress Test Thread

Assessment

Thor DP 1

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Version 2.0

System Stress Test Thread
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1. Introduction

1.1 System Stress Test Thread Overview.

This thread will evaluate the RTPS architecture to determine if the system will be able to support system load conditions. It will also serve to establish a baseline for the System Stress Test.

Included will be a support thread to demonstrate the system under several load conditions.

1.2 System Stress Test Thread Concept

The main focus of this thread is to determine how well the System performs under various load conditions using the Thor Release Software. The testing concepts and top level design developed during this thread will be with a long term goal in mind knowing that stress tests will become a normal activity after software releases.

Test Objectives:
- Verify System performance requirements are met
- Determine where the bottlenecks are in the system
- Establish a performance measurement baseline
- Determine if performance has been degraded due to a new software release
- Determine if performance has been degraded due to hardware changes

Test Development Objectives:
- design test to be repeatable
- include automation wherever possible (Regression Test Tools)
- increase or decrease loads easily and quickly
- add or remove loads
- develop new test cases quickly and easily

The System Stress Test will be developed in two phases. The first phase will stress test the CCP, DDP and CCWS using the Thor delivery and will be performed immediately following the Thor Release System Test. The second phase will build upon the first phase and will stress test the entire RTPS (including the G/Ws) using the Atlas delivery.

Phase 1 will consist of the following main items:
- Develop top level design
- Use a dedicated Data Generator (Test or CS Gateway) as the data source (up to 65,000 changes per second)
- Use system software validation TCID already being developed
- Develop Stress Test unique EIMs
- Use GSE Gateway to issue End Item commands
- Select performance monitoring utilities
- Control stress test through one main application
- Ability to increase/decrease individual loads beyond the stated performance requirements
- Ability to include/exclude SDC from stress test
- Determine where the system breakage occurs

Phase 2 will consist of the following main items:
- Use VSI as data source
- Implement Math Models
- Incorporate CLCS selected Regression Test Tool
- Utilize Regression Test Tool to control stress test
- Expand Validation TCID if necessary

- Manually build Gateway tables to achieve high change rates (need to build only once)
- Include enhancements
- Maximize automation for test control
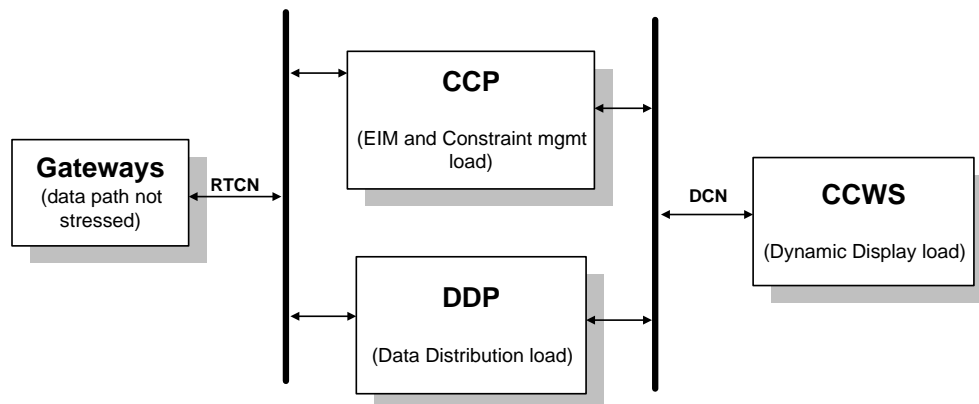
Figure 1-1 Phase 1 System Stress Test load allocations

The following figure depicts the four ways to generate a data source onto the RTCN network. For Phase 1 of the stress test, the first and fourth type of data sources will be used .
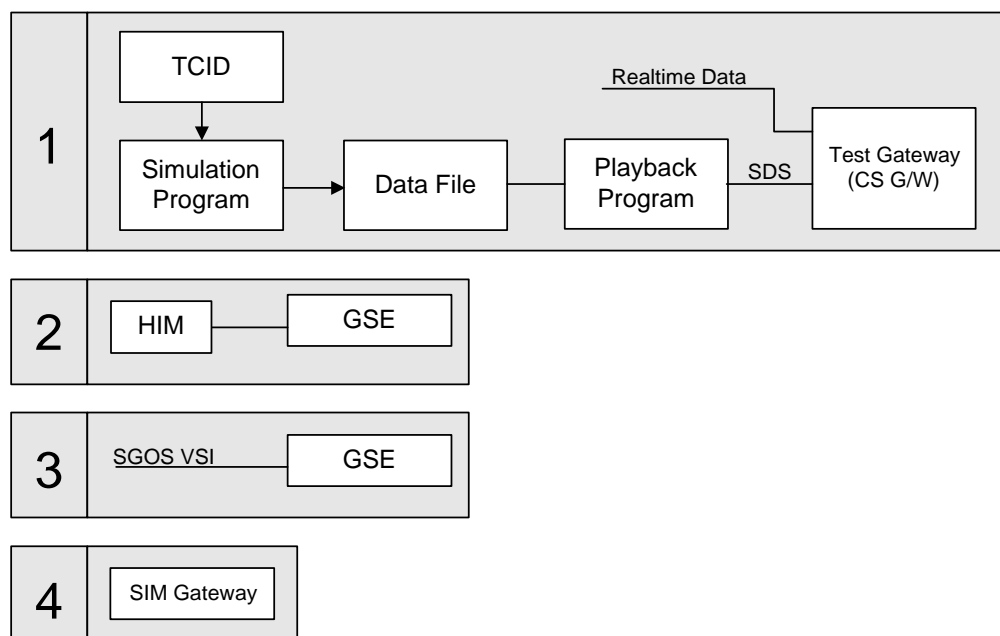
Figure 1-2 Stress Test Data Source Types

1.3 System Stress Test Thread Specification

1.3.1 Statement of Work

- Develop and present a long term Stress Test top level design for Thor

- Perform Test with Thor Baseline.

- Simulate (using real, Simulation or a Test Gateway) 35 Ground Support Equipment Gatewaysbuses, 1 PCM Link and 3 Space Shuttle Main Engine link running at rates up to all data changing.

- Utilize between 100 - 200 measurement FDs

- Provide a group of simple Data Fusion functions for up to 50% of the FD's

    - AND two Digital Pattern.

    - Average two Analogs

    - Time average Analog

    - Peak Detection

    - Compare a Analog

    - Vote three Discrete

- Provide a group of simple End Item Managers up to 30 per CCP

    - 10 End Item Managers reading 60 values every 100 ms. (600 FD reads)

    - 4 End Item Managers reading all changes of a value and signal with an event 4 other End Item Managers when value transitions a limit, 10 time per second. (160 events)

    - 13 End Item Managers reacting to events from other End Item Managers and output an Application Derived Measurement.(160 FD writes)

    - 1 End Item Managers sending Command to Ground Support Equipment at up to max rate. (500 commands)

    - 1 End Item Managers sending system messages at rate of .1 to 20 per second.

    - 1 End Item Managers continue execution of End item Manager based on Constraint Management

- Provide ability to execute the Forward Reactive Control System (FRCS) EIM

- Run up to 10 Dynamic displays in an HCICCWS. (HMF Forward Test Cell Displays)

- Provide performance data for system modeling.

- Provide mechanism to increase loads beyond the performance requirements

- Determine system "break" point

1.3.2 Requirements

(SLS-2.2.2.1.1)   The "system maximum data bandwidth" shall support 25,000 end item changes per second continuously.

(SLS-2.2.2.1.2)   The system shall support 50,000 end item measurement changes in a given second without losing any data.

(SLS-2.2.2.1.3)   The system shall support 1,000 end item measurement changes during a 10 millisecond period.

(SLS-2.2.2.1.14) The Data Health Function shall support the "system maximum data bandwidth".

(SLS-2.2.2.1.15) The Data Fusion function shall support the "system maximum data bandwidth" with one fusion calculation per change.

(SLS-2.2.2.2.1)   The Display function shall, for a single workstation, support updating 50% of the FD's every second on 13 windows with 100 FD's in each window.

(SLS-2.2.2.2.2)   RTPS shall be able to support full Uplink command rates on the following links:

- *LDB - 8/second*

- *PCM Uplink - 16.67/second or 50/second*
- GSE - 500/second.

(SLS-2.2.2.2.6)   The Display function shall, for a single workstation, support updating of 250 displayed FDs out of 500 in one second.

(SLS-2.2.2.2.13) Each CCP shall support 5 End-Item System test applications, with 6 applications for each System (30 Processes) with each application executing 500 Application Service calls per second (15,000 calls/second) while executing at 5 percent of the system maximum data bandwidth (TBD). The ratio of application service calls are 45 local application services (read, if, compare, etc.), 4 constraint management notification changes and 1 command for every 50 calls. The applications are to be the same priority level and each is allowed to execute at least 10 times per second.

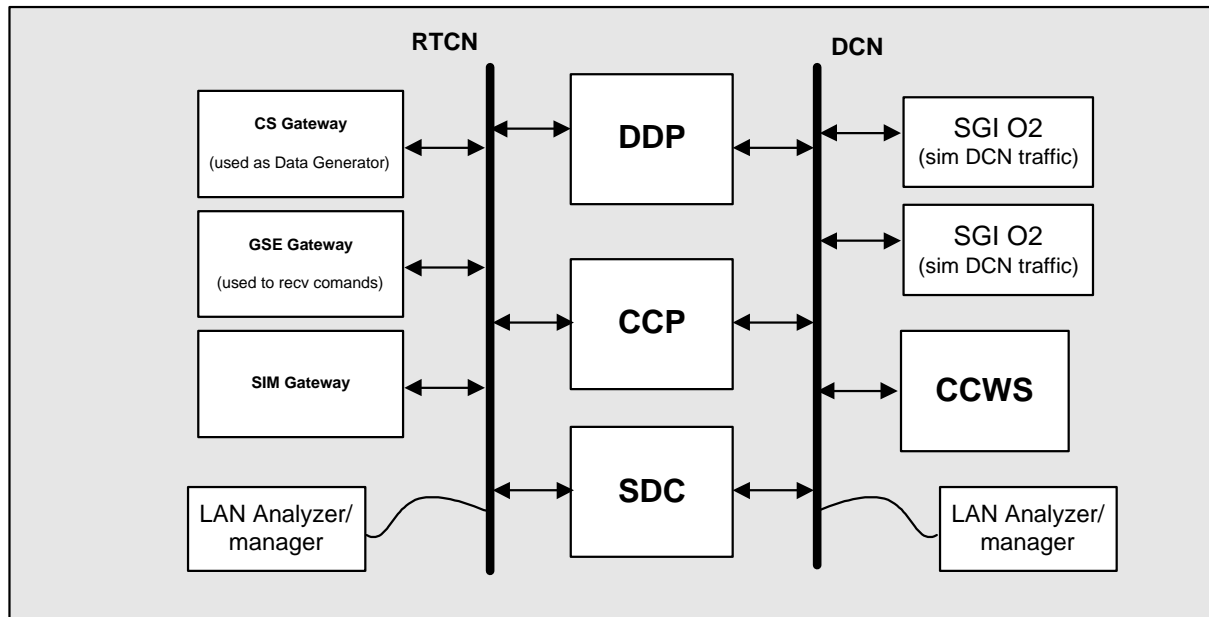## 1.4 System Stress Test Thread Thor Hardware Diagram

Figure 1-3 - System Stress Test Thor Configuration

1.5 System Stress Test Thread Deliverables

Software:

Deliverable	R&D	Code	API Manual	Users Guide
Stress Test EIMs	Yes	Yes	Yes	Yes
Data Fusion	Yes	Yes		

Documents:

Deliverable	Document
Stress Test Concept	X

Deliverable	Document
System Stress Test Plan	X
System Stress Test Report	X

1.6 System Stress Test Thread Assessment Summary

1.6.1 Labor Assessments

The total Labor Costs required to provide this capability are summarized in the following table;

No.	CSCI/HWCI Name	Thor LM	Changes covered in
1	Develop Stress Test Concept	1.0	Here
2	Develop System Stress Test Plan	1.0	Here
3	Perform System Stress Test	3.0	Here
4	Generate System Stress Test Report	0.5	Here
5	Data Distribution - Data Fusion		Data Distribution

6	Application Software
	   - FRCS EIM
	   - FTC Display
			Application S/W

7	Stress Test unique EIMs	1.0	Here
8	TCID Build & Control		Gateway Interfaces Thread
9	Data Bank		Gateway Interfaces Thread
10	Test Build (Authentication DB)		Command & Command Processing Thread
11	Validation TCID Build		Command & Command Processing Thread
12	Math Model for validation TCID		Command & Command Processing Thread
13	Performance Monitor Utilities	1.0	Here
14	CS Gateway (Data Generator)	0.5	Here
15	SIM Gateway		SIM Gateway
	TOTAL	8.0 LM	

1.6.2 Hardware Costs

Any hardware (network) analysis tools are assumed to be available.

1.6.3 System Stress Test Thread Procurement

None

1.7 System Stress Test Thread Schedule & Dependencies

1.7.1 Schedule

Task Name	Start	Finish
Thor Assessment Kickoff		07/25/97
Concept Panel Internal Review		10/21/97
Concept Panel		10/23/97
Thor Development		
Requirement Panel		N/A

Task Name	Start	Finish
Design Panel		N/A
Concept Doc		11/21/97
Data Distribution Performance Test		11/97
Test Plan (preliminary)		01/05/98
Test Plan (final)		02/13/98
Perform Test		04/98
Test Report complete	2 weeks after stress test completed	

1.7.2 Dependencies

No.	Dependency Area	Dependency	Need Date
1	Networks	Network analysis tools	3/30/98 - 04/24/98
2	Gateway	CS Gateway	3/30/98 - 04/24/98
3	Gateway	GSE Gateway	3/30/98 - 04/24/98
4	Gateway	mini HIM	3/30/98 - 04/24/98
5	SIM	SIM Gateway	3/30/98 - 04/24/98
6	Subsystem Engineering	SGI O2s (need 2)	3/30/98 - 04/24/98

1.8 System Stress Test Thread Simulation Requirements

None

1.9 System Stress Test Thread Integration and System Test

PHASE 1

The stress test will be performed on a system configured with the System Software Validation TCID and an SCID that includes stress test unique products including performance monitoring utilities, EIMs and data fusion algorithms.

The Stimuli includes:
- Data generator (CS Gateway) used as a data source
- SIM Gateway used in conjunction with HMF software
- GSE Gateway and mini HIM used to receive cmds
- Invoking various dynamic displays on the CCWS
- Executing various EIMs each performing a different task

The analysis includes:
- using performance monitoring utilities (COTS & reuse) analysis tools (will measure CPU, memory & I/O utilization)
- using vendor supplied performance monitoring utilities
- using a LAN analyzer and/or manager to measure network data rates
- viewing System messages sent to the CCWS for verification purposes.

The system test plan should include procedures to increase or decrease the following loads on an individual basis:
- RTCN traffic (change data)
- DCN traffic
- Commanding
- EIM
- Dynamic display
- Record

System Stress Test Plan and Procedures will be prepared by the System Test Organization

This test will be performed immediately following the Thor Release System Test efforts.

1.10 System Stress Test Thread Training Requirements

None

1.11 System Stress Test Thread Facilities Requirements

None

1.12 Travel Requirements

None

1.13 System Stress Test Thread Action Items/Resolution

None

2. CSCI Assessments

This section is provided for the individual CSCI leads to fill in and provide the details of their assessments. The lead should use this information to provide the summaries in section 1. The details are not presented in any of the panels unless needed by the presenter as backup.

2.1 Stress Test EIM CSCI Assessment

Provide a short overview description of the changes necessary to CSCI Name.

CSC Name 1 Work Required

This is a list of work to be accomplished for this function.

CSC Name 2 Work Required

This is a list of work to be accomplished for this function.

CSC Name N Work Required

This is a list of work to be accomplished for this function.

CSCI Assessment

Example:

CSC Name	CSC Labor (LM)	% of CSC

Basis of estimate

Provide your basis for estimating the labor to implement this capability. Lines of lines of code is one way to estimate the labor requirements. Your CSCs may be developed in such a way as to make this impractical (e.g., large amount of reuse code or code generated by a tool).

Documentation

Provide your assessment of the kinds and amount of documentation that must be provided with the capability.

Example:

Document Type	New/Update	Number of Pages

Document Type	New/Update	Number of Pages
Requirements and Design Documentation	New	
Users Guide	New	10
API Interface Document		
Interface Design Document		
Test Procedure		

Assumptions

Provide a list of assumptions you made that are pertinent to the assessment. If there are no assumptions state none.

Open Issues

Provide a list of open issues if there are any. If there are none state none.

3. HWCI Assessments

None

4. COTS Products Dependencies

4.1 SW Products Dependency List

None

4.2 HW Products Dependency List

Network analyzer and/or manager assumed available.